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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/910,824	07/24/2001	Hiroshi Tobimatsu	50090-306	3928

7590

08/02/2002

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EXAMINER

LEE, HSIEN MING

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 08/02/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/910,824

Applicant(s)

TOBIMATSU ET AL.

Examiner

Hsien-Ming Lee

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED. (35 U.S.C. § 133)
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shinohara (US 6,127,099) in view of Sakurai (US 6,287,750) and Fu et al. (US 5,807,787).

Regarding claims 1-4 and 6, Shinohara teaches the claimed method of manufacturing a semiconductor device (Figs. 2A-2G and related text) comprising the steps of :

- forming an interconnection 14 on a semiconductor substrate 11/12 having a semiconductor element such as a wiring element (not shown) formed thereon;
- forming a passivation film 15 (Si₃N₄) on the semiconductor substrate 11/12 including the interconnection 14 (Fig.2C);
- forming a photosensitive polyimide film 16 by spin-on-coating a polyimide precursor (col.3, lines 9-10), which is served as a buffer coating film, on the passivation film15 (Fig.2D);
- patterning the photosensitive polyimide film 16 (Fig. 2E);
- etching the passivation film 15 while the patterned photosensitive polyimide film 16 is taken as a mask .i.e. forming the opening (Fig.2F);

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- ashing the surface of the substrate 11/12 by an oxygen plasma, inherently including ashing the surface of the polyimide film 16, as a result of the etching (col. 3, lines 20-44); and
- curing the semiconductor substrate 11/12 by subjecting the substrate 11/12 to a heat treatment at a temperature of between 300 C and 400 C for a time of 60 minutes to 120 minutes to transform the polyimide film 16 into imide (col.3, lines 23-25).

Shinohara does not expressly teach that the ashing step is to remove a hardened layer formed on the surface of the photosensitive polyimide film 16 as a result of the etching. However, it would have been obvious to one artisan at the time of the invention was made to appreciate that the ashing step of Shinohara would inherently remove any undesirable residual layer such as the claimed hardened layer formed on the surface of the photosensitive polyimide film 16 because Shinohara teaches the ashing process using oxygen plasma for the removing, which is the same technique as claimed for removing the hardened layer. In other words, the removing of the hardened layer is the consequence of the ashing process of Shinohara even though he is silent as to the hardened layer. This can be substantiated by the ashing process of Sakurai, in which he teaches utilizing the ashing process by the oxygen plasma to remove a hardened layer from the surface of a photoresist layer 205 (col.2, lines 41-49, Sakurai), in which the photoresist layer can be the photosensitive polyimide film, which is further evidenced by Fu et al. (col. 5, lines 39-40).

Regarding claim 5, the selection of the removed thickness is obvious because it is a matter of determining optimum process condition by routine experimentation with a

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limited number of species. In re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and In re Boesch, 205 USPQ 215 (CCPA 1980)(discovery of optimum value of result effective variable in a known process is obvious). In this case, it would have been obvious to one artisan in the art to remove a desired thickness from the polyimide film during the ashing process as taught by Shinohara in view of Sakurai to eliminate the hardened layer formed on the surface of the polyimide film without compromising the integrity of the remaining thickness of the polyimide film. In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results. See M.P.E.P. 2144.05 III.

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-Ming Lee whose telephone number is 703-305-7341. The examiner can normally be reached on M-F (9:00 ~ 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 703-308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-0142 for regular communications and 703-305-0142 for After Final communications.

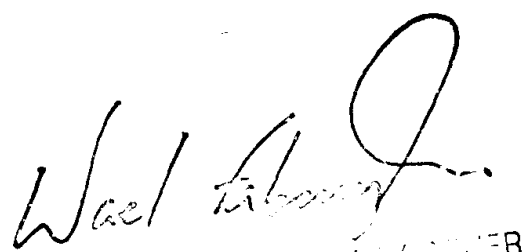
Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

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Hsien Ming Lee

July 31, 2002



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